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A MULTIVARIATE ANALYSIS OF NAVY PHYSICIAN RETENTION

by

Richard Peter Franco

December 1989

Thesis Advisor: George W. Thomas

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A Multivariate Analysis of Navy Physician Retention

by

Richard Peter Franco
Lieutenant, Medical Service Corps, United States Navy
B.S., Southern Illinois University, 1987

Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

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December 1989

ABSTRACT

This thesis examines factors which influence the retention of Lieutenant and Lieutenant Commander Navy physicians with nine or fewer years of service. Logit regression was used to estimate the impact of various demographic, tenure, economic and perceptual variables on retention behavior. The data used was a merged data base which combined the responses from the 1985 DoD Survey of Officer and Enlisted Personnel with actual retention data from 1988 personnel records, data from the 1985 BUMIS Medical Officer File, and data from the 1985 Medical Economics Survey of Civilian Physician Earnings. Findings include indications that physicians who hold the rank of Lieutenant Commander, are board certified or fully trained specialists or are general medical officers were more likely to leave the service than their peers. Satisfaction with specific intrinsic and extrinsic job conditions was shown to significantly increase retention. Marital status, race, gender and the military/civilian pay ratio had no impact on retention likelihood. Policy implications, study limitations and recommendations for further research are also discussed.

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I. INTRODUCTION

A. GENERAL

Turnover in organizations is often defined as the combined process of recruitment and attrition. Of these system flows, attrition (the leavers) receives the most attention. Although sometimes beneficial, attrition most often results in negative organizational consequences. These include substantial investment costs of recruitment and training of replacements, productivity losses while replacements are in training, and disruption of social and communication structures. When attrition affects one segment of the organization more than others, the experience mix is affected resulting in long term turbulence appearing as dips that migrate throughout the system. Recruitment goals, promotion plans, and budget forecasts all depend on the ability to predict the turnover behavior of individuals accurately. Predicting turnover is important in the military since the negative consequences of turnover lead to readiness problems.

The Navy has experienced significant shortfalls in many medical specialties making it difficult to provide quality medical care for its beneficiaries. By the end of FY 88, the Navy was short by nearly 300 physicians, dentists, nurses and physician assistants and experiencing significant shortfalls

in critical technical specialties in the Hospital Corps [Ref. 1]. Congress, recognizing that Navy Medicine is unable to meet its peacetime demand, has mandated increases in medical department officer endstrength over the next three fiscal years [Ref. 1: p. IV-1].

Achieving this endstrength will be difficult due to a national shortage of nurses and the existing physician recruitment and retention problems believed to be the result of a military/civilian pay gap of as much as $50 to $100 thousand in certain medical specialties. Further, the implications of the Graham, Rudman, Hollings Deficit Reduction Act cause the entire military medical system to be viewed as cost constrained rather than a progressive medical treatment system, which will lead many more doctors and nurses to leave the military and others to avoid entering the service.

This thesis will develop a multivariate model of physician retention based on the theoretical framework of job turnover proposed by Arnold and Feldman, an extension of the Mobley, et al., 1979 model. Physician's stated career intentions will also be analyzed to compare stated career intention with actual behavior. These objectives are accomplished using the 1985 Department of Defense Survey of Officer and Enlisted Personnel augmented with the data contained in the 1988 Bureau of Medicine Information System (BUMIS) Medical Officer File (MOF). Retention equations are estimated using the Logist

Procedure available on the Statistical Analysis System (SAS) software package.

Chapter II presents an overview of the existing research on physician retention behavior as well as research on the validity of using stated intentions to forecast actual behavior. Chapter III describes the methodology or basic approach to the research. This includes the theoretical framework, description of the data, model specification and variable definitions. Chapter IV presents the results of the research. Finally, Chapter V discusses conclusions, recommendations, and policy implications of the research findings.

B. BACKGROUND

The Navy has, to some extent, relied on aggregate continuation rates to monitor medical corps staffing. The aggregate continuation rate for Navy physicians has been relatively constant since 1980, averaging 88% [Ref 2]. Although aggregate continuation rates have been stable, stocks of medical corps officers had been decreasing. By FY 88, the shortfall was 353 physicians of 4,282 authorized, or 92% of authorizations.

As the discussion above indicates, there are drawbacks to using aggregate retention rates. It is also important to note that no distinction is made between voluntary and involuntary

continuation in aggregate rates. Since 61% of the Medical Corps has been under obligation and unable to leave the Navy in a given year, aggregate retention rates give a misleading picture of physician retention. Further, aggregate continuation rates provide no information on shortages within specialties.

Career decision points are commonly used to evaluate retention. Physicians have two career decision points. The end of initial obligation marks the first point in a career that a physician can leave the service. Retirement is the second career decision point. It is difficult to determine the particular year of service at which an obligation is discharged since physicians enter the service via many different accession programs with varying obligation requirements. Research has shown that only 9% of the annual physician endstrength complete initial obligation during a given year. Large changes in the retention of these individuals go relatively unnoticed since this has little impact on aggregate retention rates. [Ref 2:p. 10] The historical retention of specialists under initial obligation has declined from 47% in 1984 to 34% in 1987. [Ref 2:p. 11]

The experience level among specialties has shown consistent decline. The 17 specialties listed at Table 1 have experienced an increase in the percentage of newly trained physicians since 1983 [Ref. 2:p 20]. This is especially

important in the context of Navy medical residency programs and the structure of the medical corps.

TABLE 1. PERCENTAGE OF FULLY TRAINED SPECIALISTS WITH ONE TO FIVE YEARS EXPERIENCE[a]

Specialty	FY83	FY87
Aerospace	9(22)[b]	38(13)
Anesthesiology*	62(86)	81(110)
Dermatology*	50(34)	65(37)
Emergency	75(12)	88(24)
Family Practice	74(199)	78(179)
General Surgery*	40(144)	54(180)
Internal Medicine	58(146)	67(141)
OB/GYN	53(128)	64(105)
Orthopedics*	55(69)	78(93)
Otolaryngology*	51(43)	60(42)
Pediatrics	45(206)	47(172)
Plastic Surgery*	43(7)	46(13)
Preventative Med	38(26)	52(25)
Psychiatry*	39(101)	40(83)
Radiology*	56(102)	55(91)
Thoracic Surgery*	30(10)	40(10)
Urology*	62(34)	63(35)

* indicates wartime required specialties

a. Experience is defined as the number of years since completion of first residency

b. Population size in parenthesis

Source: Adapted from the Center for Naval Analyses Report CRM 88-231, "Medical manpower shortages and the retention of Navy physicians," May,L.J., Graham, A.E. and Dolfini, M.A., p. 20, Mar 89.

Residency programs are the cornerstone of Navy medicine, the primary recruiting and retention tool for physicians [Ref.

3]. Medical students are recruited into the Navy where scholarships and stipends are exchanged for obligation. Many of these physicians stay beyond their scholarship obligation, incurring additional obligation for residency training. If one assumes that accession of direct procurement physicians is negligible (due to disparity in the physician military/ civilian pay ratio), one can easily see that nearly the entire supply of Navy physicians is delicately balanced on the number of obligated physicians. Senior career physicians become the residency directors at major teaching centers or medical directors at smaller medical treatment facilities. Physicians in training and those under obligation for completed training are the bulk of the health care providers at medical treatment facilities and staff physicians at teaching centers. The implication is that less experienced physicians are being required to provide leadership and training to new physicians in a vicious circle of diluted experience.

The evidence points to a worsening problem in the retention of Navy physicians. An assessment of the factors that determine medical officer retention is important if the medical department is to meet both wartime and peacetime mission.

II. LITERATURE REVIEW

A. TURNOVER DEFINED

Job turnover or "leaving" an organization is an act marked by a person physically terminating his relationship with an organization, for whatever reason. Military turnover studies are often termed retention studies and defined or quantified in terms of retention rates. Regardless of military or civilian terminology, turnover has been classified as either voluntary and involuntary. Involuntary turnover covers all losses beyond the control of the individual, such as death, ill-health, retirement, layoffs, or permanent discharges. Voluntary turnover occurs when an individual leaves of his own choice, often to take another job. The majority of turnover is voluntary and the focus of much turnover research is on the reduction of voluntary turnover since is assumed that this type of turnover can be affected by the policies of an organization [Ref 4].

Whether voluntary or involuntary, turnover has both positive and negative organizational and individual consequences. Table 2 lists these consequences. For the organization, voluntary turnover is a significant source of costs from those inherent in recruiting and training new recruits to replacement and out-processing costs. Other negative aspects include disruption of social and

communication structures, loss of productivity, and decreased satisfaction among those who must perform extra duties until a replacement is selected and trained. The positive organizational benefits, which are rarely identified are the release of poor

TABLE 2. POSSIBLE POSITIVE AND NEGATIVE ORGANIZATIONAL CONSEQUENCES OF EMPLOYEE TURNOVER

Possible Negative Consequences	Costs (recruiting, hiring, assimilation, training) Replacement costs Out-processing costs Disruption of social and communication structures Productivity loss (during replacement, search and retraining) Loss of high performers Decreased satisfaction among stayers
Possible Positive Consequences	Displacement of poor performers Infusion of new knowledge via replacements Stimulate changes in policy and practices Increased internal mobility opportunities Increased structural flexibility Increased satisfaction among stayers Opportunities for cost reduction and consolidation

Source: Adapted from Mobley, William H., "Some Unanswered Questions in Turnover and Withdrawal Research," Academy of Management Review, 1982, 7:1, p. 113.

performers, infusion of new ideas and knowledge from replacements, increased internal mobility which results in increased satisfaction among stayers, and opportunities to reevaluate existing structures that can result in opportunities for cost reductions and consolidations.

Table 3 shows that the impact on individuals may be both positive and negative. The individuals who leave risk losing seniority, non-vested benefits, transitional stress, career path regression, and more recently, disruption of the spouse's career path. Leavers may benefit from career advancement, increased earnings, self-development and overall better person-organization fit that results in less stress, better use of skills and interests. For stayers, turnover may result in disruption of social and communication pattern, loss of valued co-workers, decreased satisfaction, increased work load during and immediately after search for replacement, decreased commitment and cohesion. Aside from these negative impacts, the stayer may benefit by increased opportunity for internal mobility, stimulation from new co-workers, and increased satisfaction, cohesion, and commitment.

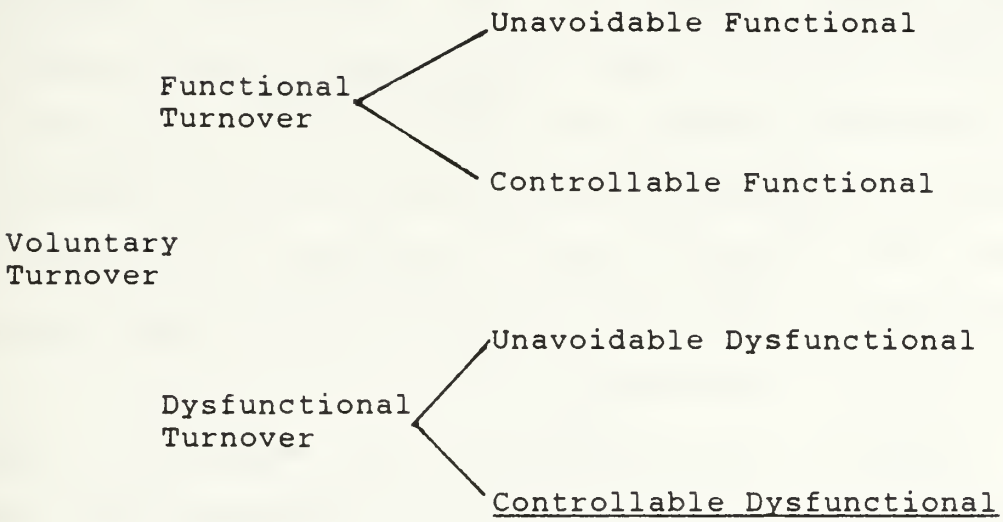
Dalton, et al., [Ref. 5] propose that turnover be viewed as either functional or dysfunctional. Figure 1 defines the Dalton, et al., view. Suppose an employee quits voluntarily

TABLE 3. POSSIBLE POSITIVE AND NEGATIVE INDIVIDUAL CONSEQUENCES OF EMPLOYEE TURNOVER

Leavers	Stayers
Negative	
Loss of seniority and related prerequisites	Disruption of social and communication patters
Loss of non-vested benefits	Loss of valued co-workers
Disruptions of social support systems	Decreased satisfaction
Disillusionment via "grass is greener" phenomena	Increased work load during and immediately after search
Transition related stress	Decreased cohesion
Disruption of spouse's career path	Decreased commitment
Career Path Regression	
Positive	
Increased earnings	Increased internal mobility opportunity
Career advancement	Stimulation, cross-fertilization from new co-workers
Better person-organization fit	Increased satisfaction
Renewed stimulation in new environment	Increased commitment
Self-development	

Source: Adapted from Mobley, William H., "Some Unanswered Questions in Turnover and Withdrawal Research," Academy of Management Review, 1982, 7:1, p. 113.

Figure 1. Dysfunctional/Functional Turnover

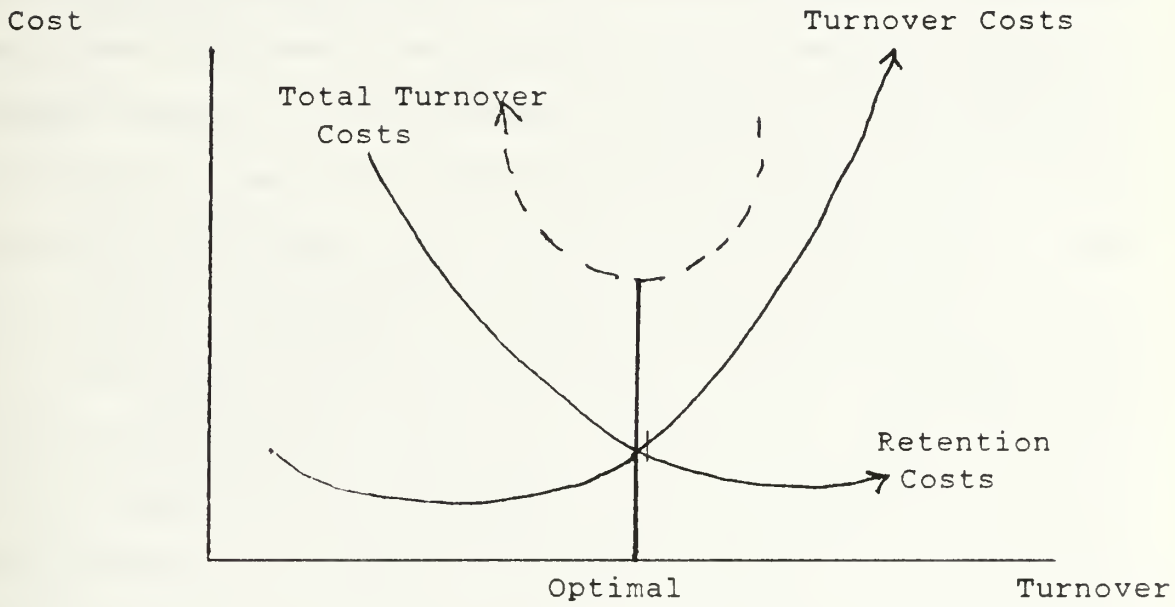


Source: Adapted from Dalton, D.R., Todor, W.D., and Krackhart, D.M., "Turnover Overstated: The Functional Taxonomy," Academy of Management Review, v. 7, 1982, p. 117-123.

and the organization desired that this individual quit; this is functional turnover. Now, suppose that an employee quits due to factors external to the job, say spousal pressure, and, that the organization found this employee desirable; this is dysfunctional turnover. The basic assumption is that there is some functional and dysfunctional turnover that is unavoidable as well as some that is controllable. The problem then becomes control of the controllable dysfunctional turnover, the only place the organization can do itself good. If voluntary turnover were a total of 30%, and equally split between functional and dysfunctional turnover at 15% each, and this split equally among unavoidable and controllable components at 7.5% each, one can easily see that the impact of turnover is misleading.

Figure 2 describes Abelson and Baysinger's [Ref. 6] proposed model of optimal levels of organizational turnover. They propose that organizations should attempt to achieve an optimal rate of aggregate organizational turnover, defined as that rate consistent with balancing the organizational costs of turnover with the organizational costs of reducing it any further toward zero. Dysfunctional turnover is then defined as any rate that deviates from an optimal turnover rate.

Figure 2. Optimal Organizational Turnover



Source: Adapted from Abelson and Baysinger, "Optimal and Dysfunctional Turnover: Toward an Organizational Level Model," Academy of Management Review, 1984, 9:2, p. 331-341.

Optimal organizational turnover is the avoidance of dysfunctional turnover, with the latter defined as loss of employees the organization prefers to retain on a cost adjusted basis.

Just what causes one to leave an organization has been the focus of much empirical study in turnover and withdrawal research. Cotton and Tuttle [Ref. 7] reviewed 120 published scientific studies of turnover using meta-analytic techniques and identified 27 variables correlated with turnover. Table 4 lists these correlates categorized as external, work-related and personal variables. Three of the four listed external correlates are strongly related to turnover. Many of the work-related factors are highly reliable correlates of turnover. The most notable correlates are pay, performance, overall satisfaction and satisfaction with supervision, promotions, co-workers and organizational commitment. The personal characteristics of employees related to turnover include age, tenure, number of dependents (negative relationships); education, gender and behavioral intentions are positively correlated to turnover. Surprisingly, marital status was found to be weakly related (negatively) to turnover. Cotton and Tuttle used tepwise regression to identify moderators of key variables inthe turnover process. The findings indicate that the srength of the relationship between pay and turnover is dependent upon the employees

TABLE 4. CORRELATES OF TURNOVER

Turnover Correlates	Direction of Relationship
External	
Employment perceptions	+
Unemployment rate	-
Accession rate	+
Union presence	-
Work Related	
Pay	-
Performance	-
Role Clarity	-
Task Repetitiveness	+
Overall Satisfaction	-
Pay Satisfaction	-
Satisfaction with work itself	-
supervision	-
co-workers	-
promotion	-
Organizational Commitment	-
Personal	
Age	-
Tenure	-
Gender	+(women)
Education	+
Marital status	-(married)
Number of Dependents	-
Intelligence	+
Behavioral Intentions	+
Met Expectations	-

Source: Adapted from Cotton and Tuttle, "Employee Turnover: Meta Analysis and Research with Implications," Academy of Management Review, 1986, v. 11, p. 61.

work environment factors, job related factors and personal factors. The basic premise of the model is that factors in all categories lead to job satisfaction via met expectations. In other words, reduced turnover can be expected when expectations in each category are met thought to be due to increased job satisfaction. This proposed model received little attention or empirical testing.

Muchinsky and Morrow [Ref. 8:p. 274] proposed a turnover model based on a review of literature from psychological, sociological and economic perspectives. The model is as follows:

individual factors + work related factors → economic opportunity factors (all three simultaneously) → turnover

Individual factors are those relating to the employee, such as age, gender, and race. Work related factors are those variables describing the interface between individuals and organizations, including feedback, recognition, responsibility, job satisfaction, organizational commitment, pay and others. Economic opportunity factors include the sate of the labor market, geographic location of an organization, etc. Muchinsky and Morrow found empirical support for the state of the economy as a strong predictor of turnover. This model also received little attention in the literature.

In 1977, Mobley [Ref. 10], proposed a complicated model of the employee withdrawal process that identified a variety

of possible precursors to turnover. In 1978, Mobley et al. [Ref. 11] evaluated a simplified version of the earlier model with a sample of 203 hospital employees. The results of that study combined with a literature review resulted in the publication of the 1979 model of turnover [Ref. 12]. Arnold and Feldman summarize the Mobley et al., model as follows:

> individual values → affective responses → intention to search and intention to quit (simultaneously) → turnover

It was proposed that these elements in the process of turnover were moderated by centrality of work values or the non-work consequences of quitting and organizational, economic, personal and occupational variables.

Mitchell [Ref. 13] used multiple regression to test several aspects of this turnover model on a sample of 776 managers from 43 life insurance companies. The major finding supported the Mobley model in that there was a strong relationship between intention to quit and subsequent termination. Tenure was found to be correlated with turnover which emphasizes that time variables must be included in turnover research. One surprising aspect of this study was that the direct effect of personal and organizational variables were found not to be related to turnover. It was recommended that further research be done to include the effects of individual perceptions on turnover.

pay is more significant for professionals than blue collar and non-managerial employees. Satisfaction with work is also less reliably related to turnover among blue collar employees then professionals. There are also gender differences, Gender effects on turnover are less reliable among non-managerial and non-professional employees.

There still remains a need to identify the actual turnover process. The next section of this paper summarizes several causal models of employee turnover.

B. MODELS OF THE TURNOVER PROCESS

The problem with the existing theorized processes of turnover is that they are not well integrated [Ref. 8]. Psychologists, sociologists and economists have developed processes that let each specialty rule its domain of inquiry, excluding factors not germane to their discipline. In a 1980 literature review of turnover research, Muchinsky and Morrow [Ref. 8:p. 264] state that theories of turnover demonstrating a greater appreaciation for inter- disciplinary factors merit special consideration and it is theories of this type that this review will focus on.

Porter and Steers [Ref. 9] developed one such conceptual framework of employee turnover utilizing four categories of factors, each representing one level in an organization. These categories were organization wide factors, immediate

Michaels and Spector [Ref. 14] also tested the 1979 Mobley model on a sample of 112 mental health facility employees. Their results led to the following turnover process:

> individual factors + organizational factors → job satisfaction + organizational commitment (together with) perceived alternative employment opportunities → intention of quitting → turnover

Individual characteristics include items such as salary, organizational level, age, tenure, and confirmed expectancies. Organizational factors include perceived job or task characteristics and perceived supervisor's job consideration behavior. Confirmed expectancies and organizational commitment are variables not included in the model but added as suggested possible precursors to job satisfaction or turnover, respectively.

Overall, findings were supportive of the Mobley Model. It was found that perceived alternative employment opportunity was not a direct antecedent of intention or directly related to turnover. It was hypothesized that even though not significant here, a good job market will lead to more turnover. Organizational commitment did not predict intent to turnover as well as job satisfaction but did add to the overall predictive capacity of the model.

Based on a review of the literature, Steers and Mowday [Ref. 15] suggested a model of the process leading up to voluntary turnover. The model is as follows:

individual characteristics → job expectations and values → affective responses to job → desire/intent to stay/leave → stay/leave

It is thought that available information about jobs and alternative job opportunities together with individual characteristics influence job expectations and values. These factors are thought to lead to affective responses to the job, moderated by organizational characteristics and experiences and job performance level. These affective responses include job satisfaction, job involvement, and organizational commitment. Affective responses then lead to desire or intent to stay/leave, moderated by either efforts to change the work situation and non-work influences such as spousal pressures to stay or leave. This model is an extension of the Mobley et al., 1979, model in that an attempt is made to determine the intermediate linkages between performance and turnover. The distinguishing feature of this model is that is incorporates the role of available information about the job, job performance as a factor in affective responses, and places emphasis on non-work factors such as spousal pressures that have been shown to influence either intent or actual turnover.

Lee and Mowday [Ref. 16] tested the Steers and Mowday model on a group of 445 financial institution employees. They found partial support for the model. Available information about a job and an organization explained a significant proportion of variance in met expectations and job values.

Job performance, met expectations, job values, organizational characteristics and organizational experiences explained significant variation in affective responses. Job involvement, job satisfaction and organizational commitment also explained significant a portion of incremental variance on intent to leave. Contrary to the model, it was found that alternative job opportunities did not explain the variation in met expectations and job values and made no contribution toward intent to leave or actual leaving. There was also no support for efforts to change a situation explaining the variance in affective responses, nor was there support for an interactive effect between available job opportunities and actual leaving.

Arnold and Feldman [Ref. 17] developed a working model of turnover based on a multivariate analysis of a sample of 654 professional accountants. This work appears to be a further extension of the 1979 Mobley et al., model. The proposed model is:

> demographic + tenure + cognitive/affective responses + perceived job security → intention to search for alternatives → intention to turnover → turnover

The demographic variables included items such as age, gender, marital status and number of dependents. Tenure variables were included seperately since it was felt that tenure is a characteristic of the individual-organizational relationship rather that the individual alone. The cognitive/affective

category includes variables designed to asses the individual's perceptions of and feelings regarding the job and organization. These were job satisfaction, organizational commitment and satisfaction of expectations.

The results were supportive of the existence of significant relationships between actual turnover and the tested variables but did suggest some modification. Demographic and cognitive/affective variables appear to influence turnover indirectly through their impact on intention to search for alternatives.

C. STUDIES OF MILITARY TURNOVER (RETENTION)

Hand, Griffith, and Mobley [Ref. 18] performed a critical review of existing literature on military enlistment, reenlistment and withdrawal research. They identified and evaluated 11 categories of explanatory variables for their impact on both retention and intent to reenlist. The 11 categories are listed in Table 5. The review was intended to identify categories of variables significant to the decision to reenlist and not the cognitive process of turnover. With this in mind, economic variables were found to be the most significant for reenlistment. The remaining 10 variable categories contributed only small amounts in accounting for the variation in the dependent variable. Several basic conclusions drawn from this research effort were:

- the research omitted two significant classes of variables: the ratio of military to civilian wages for specific specialties and DOD separation policies; and,

- that models should include as many categories of explanatory variables as possible since no one category will account for a substantial amount of variation by itself.

TABLE 5. VARIABLE CATEGORIES RELEVANT TO RETENTION

Economic	Intention
Organizational practices	Expectations
Organizational Climate	Biodemographic
Job content	Psychological
Satisfaction	Aptitude
Performance	

Source: Adapted from Hand, H. H., Griffith, R. W., and Mobley, W. H., "Military Enlistment, Reenlistment and Withdrawal Research: A Critical Review of the Literature," (NR 170-819), Alexandria, VA: Defense Technical Information Center, 1977, (U191898)

Bludedorn [Ref. 19] proposed a model of turnover for military officers based on a review of military and civilian turnover literature. The proposed model is :

organizational structure + organizational environment → job satisfaction → turnover

The proposition here is that two sets of exogenous variables, organizational structure and environment, have indirect effects on turnover via their impact on job satisfaction.

Bludedorn used regression equations to test this model on a sample of 7,232 commissioned and warrant U.S. Army officers drawn in 1964 to study the feasibility of an all-volunteer force, or in other words, turnover in the military. Intent to turnover was the dependent variable. The structural explanatory variables include pay and reaction to control. The environmental explanatory variables were environmental push and environmental pull. Job satisfaction explanatory variables included responses to a question about the respondent's feelings about life in the Army.

Environmental push was measured by asking if the respondent would have joined the service if there was no draft. Environmental pull was assessed by asking the respondent's opinion comparing his military work with work he could do in the civilian sector.

The resultant model accounted for 65% of the variance in turnover of U.S. Army officers, supporting the 1979 Mobley proposition that intention is antecedent to actual turnover. It was also found that organizational control added relatively little to the model, though it had been anticipated to be one of the more important determinants of turnover.

The Annualized Cost of Leaving (ACOL) Model developed by Warner and Nelson [Ref 20] is used by the Navy to analyze how enlisted retention behavior will change in response to changes in pay, bonuses and the civilian unemployment rate. The ACOL

approach assumes that the individual decides whether to stay or leave the service based on the perceived costs and benefits of the alternatives, choosing the alternative that maximizes satisfaction. ACOL is specified as:

$$ACOL = M + B - C$$

where M is the present discounted expected value of military pay excluding bonuses; B is the present discounted expected value of bonuses; and C is the present discounted expected value of civilian pay.

The model has been characterized as being composed of monetary and psychic categories of variables. Key to this model is that it is understood that a person's "taste" for military service is implicitly considered. Those who reenlist in spite of a higher payoff of civilian alternatives have a higher taste for military life.

Motowidlo and Lawton [Ref 21] proposed and tested a causal chain in the context of a soldier's reenlistment decision. The proposed model is:

perceptions → satisfaction → expectancies → intention → reenlistment

Models were proposed and tested using two independent samples of soldiers. Actual retention behavior was the dependent variable in a series of regression equations which ultimately ruled out two of the three proposed models.

The researchers concluded that satisfaction influences turnover intention only through its effects on expectancies. Further, they recommended that strategies for reducing turnover should focus on policies that promote job satisfaction, improve job conditions, supervisory conditions and other organizational features to keep dissatisfaction to a minimum.

D. STUDIES OF MILITARY PHYSICIAN TURNOVER

Daubert [Ref. 22] proposed a model of volunteer Air Force physician turnover based on a theoretical framework similar to ACOL, discussed earlier in this paper. The proposed model of the decision process is:

$$U = f(Y, E, P)$$

which states that volunteer Air Force Physicians will decide to stay or leave, selecting the alternative that maximizes their utility, (U). Utility is thought to be a function of personal characteristics, (P), the physician's subjective ranking of available employment opportunities according to their money income (Y), within other characteristics of employment, (E). Within this framework, Daubert defined two categories of variables: personal characteristics (age, gender, specialty); and practice choice variables (grade, assignment).

A model of Air Force volunteer physician retention was developed using the above framework and the data contained in the 1975-1982 Air Force Uniformed Officer Record supplemented with data from the Uniformed Services Almanac, 1976-1983, and the Annual Physician's Earnings Survey, 1975-1982, in Medical Economics. The study found that volunteer physician retention behavior is responsive to changes in the military/civilian pay ratio, particularly for board certified surgeons and obstetricians. Other factors significant in the stay/leave decision were commissioning source, board certification, pay grade and age.

Mullins [Ref. 23] developed a model of Navy physician retention based on the cross-sectional data of the 1983 Medical Officer File, a subset of the Bureau of Medicine master personnel files. No explicit process of a physician's decision to stay or leave the Navy was provided. The model developed was based on personal and economic variables. The personal variables included specialty, commissioning source, location in career path, graduation from foreign medical school and augmentation status. The economic variables included basic military compensation and civilian pay. The study included obligated and non-obligated physicians which biases the results since obligated physicians cannot leave the Navy. Further, Since no proposed conceptual framework was given, one must assume ad hoc curve fitting, normally

resulting in models that do not provide insight into policy implications for improving retention.

McMahon [Ref. 24] developed a model of unobligated physician retention based upon biodemographic, economic, tenure, and cognitive/ affective variables to estimate the impact of pay on retention. Using the Bureau of Medicine Medical Officer File, 1983-1987, augmented with physician civilian pay information collected from the American Association of Medical Colleges Survey data, a model was developed that focused on the influence of the military/civilian pay gap and its effects on physician retention.

Findings indicated that a higher the military/civilian pay ratio was related to an increased probability of leaving the service. Other factors negatively affecting retention were having dependents and commissioning source. Rank, age, gender and nearness to retirement decreased the probability of leaving the Navy.

Physician retention was the focus of several Master's Theses done at the Naval Postgraduate School. Ferris and Peters [Ref.25] using discriminant analysis, found length of service, command organization, overall job satisfaction, occupational commitment, need for independence, job satisfaction and other non-pecuniary factors to be relevant to the decision to stay or leave.

Cain [Ref. 26] improved on the previous work using the data contained in the 1978 Survey of Officer and Enlisted Personnel in studying the motivational factors involved in the career decisions of obligated and non-obligated caucasian male Navy physicians with between four and ten years of service. Using career intent as the dependent variable, Cain found a combination of relevant economic and motivational variables which include overall satisfaction with military life, the chance for interesting work, coworkers, job location, chances for promotion, and feelings that the military member's family would be better off if the member were in a civilian job. Satisfaction with military life accounted for over half the variation in career intent. The study was plagued by problems of small sample size (n = 48).

Menifee [Ref. 27] used the 1978 Survey of Officers and Enlisted Personnel to study the organizational commitment of Navy physicians past their initial obligation period. Organizational commitment was measured by the physician's intended years of service beyond his initial obligation.

Menifee found the military-civilian pay comparison and motivational aspects important to organizational commitment as well as the retention issue. The motivational factors include immediate supervisory relationships and retirement benefits. Some of the problems associated with this research effort include small sample size (n = 57), and use of stepwise

regression analysis, which creates models with short term predictive ability.

Whelan [Ref. 28] used data in the 1985 Bureau of Medicine Medical Officer File to analyze the retention behavior of non-obligated Navy physicians. Using the Annualized Cost of Leaving Model as the theoretical base, he found that physicians's specialty and source of entry were significant in the decision to stay or leave, as well as military pay, augmentation status, training received, being a graduate of a foreign medical school, age and length of service.

III. METHODOLOGY

A. RESEARCH OBJECTIVES

The purpose of this thesis is to determine the factors affecting Navy physician retention. A second objective is the comparison of physician retention intentions with actual behavior.

B. PROPOSED CONCEPTUAL FRAMEWORK

The theoretical framework for the model is that proposed by Arnold and Feldman [Ref. 17]. Retention or turnover is a function of biodemographic, tenure, economic, and perceptual variables. The context of the stay or leave decision is nearly always a choice between practicing medicine either in the military or in the civilian community. The physician may leave active duty to become a drilling or inactive reservist but his primary job will be in the civilian sector. A physician may leave the service and the practice of medicine, either voluntary or involuntarily, but this would be an uncommon occurrence.

C. DATA DESCRIPTION

The principal data source for this study is the 1985 Department of Defense Officer and Enlisted Personnel Survey merged with the Officer Master Files as of September 1988 to

ascertain if a physician actually left or stayed in the Navy. These data were supplemented with data from the 1988 Medical Officer File, a subset of the larger Bureau of Medicine Information System (BUMIS), maintained by the Bureau of Medicine and Surgery. A separate discussion of each database follows as well as a description of the characteristics of the merged data set.

1. 1985 DOD Survey of Officer and Enlisted Personnel.

This survey was conducted for the Office of the Assistant Secretary of Defense (Force Management and Personnel) (OASD(FM&P)) by the Defense Manpower Data Center (DMDC) [Ref. 29]. The 1985 DOD Survey was conducted as follow-on research from the 1978 DOD Survey of Officer and Enlisted Personnel conducted by the Rand Corporation for the same office to provide decision makers with information on military life cycles, personal attitudes and decisions to leave the military. The two specific purposes of the 1985 Survey were to asses the effects of family issues on retention and to evaluate the impact of several personnel policies that had recently been implemented. In addition to the survey of service members, a separate survey of military spouses was conducted to gain insight into family issues not previously addressed in past surveys.

The 1985 Survey was designed to survey the total active duty population of all the armed services. The survey

was fielded in January 1985 to a world-wide sample of 132,007 active duty military members in all services, both inside and outside of CONUS. The effective sample size was reduced to 124,590 due to separations during the interval between selection for participation and the time the questionnaire reached the unit to which the member was attached. Officers, females and Marine Corps personnel were sampled at a higher rate to facilitate a more detailed analysis of these groups. Each service member sampled had to have completed a minimum of four months of active duty to participate in the survey. Data collection resulted in an overall officer response rate of 76.8% and 70.1% for the enlisted sample. The Navy officer sample size was 5,046 of which 3,975 were usable, a response rate of 78.8%. The Navy physician sample size was 191.

The survey was administered using three different test forms, one each for officers, enlisted and spouses. The officer and enlisted forms were essentially identical with differences primarily in terminology and inclusion of certain items pertaining to officers and others to enlisted personnel.

Table 6 provides a list and brief description of the nine major subject areas the survey was designed to address. These subject areas cover a wide range of topics and provide data that could be utilized to study:

- Responses of military personnel to changes in military compensation and benefits recently enacted,

TABLE 6. MAJOR SUBJECT AREAS OF THE 1985 DOD MEMBER SURVEY (OFFICER)

Military Information	Paygrade Procurement source Obligated service remaining
Present/Past Location	Length of stay Expected stay Problems encountered
Reenlist/Career Intent	Expected years of service Expected paygrade upon leaving Behavior under different personnel management options
Individual/Family Characteristics	Gender Age Marital Status Education
Dependents	Same as Individual/Family
Mil Comp/Benefits/ Programs	Opinion on benefits received, level of satisfaction
Civ Labor Force Experience	Previous jobs held
Family Resources	Earnings Non-wage sources of earnings
Military Life	Attitudes toward: pay and allowances interpersonal environment benefits

Source: 1985 DOD Survey of Officer and Enlisted Personnel

- readiness and retention factors,
- reactions to proposed changes in personnel management,
- differences in orientations, attitudes and experiences between different subgroups,
- demographic, household, familial and other characteristics of military personnel and special groups,
- impact of policies on aspects of military and family life,
- family well being (economic issues), and
- demand for and perceived adequacy of family services.

2. **1982-1988 BUMIS Medical Officer File.**

The Bureau of Medicine Information System (BUMIS) is maintained by the Bureau of Medicine and Surgery. The BUMIS file contains both military and job specific information on all medical staff corps officers (medical, dental, medical service, nurse). The Medical Officer File (MOF) is the subset of the BUMIS file containing information on the medical corps such as specialty, commissioning source, obligation expiration and expected loss dates. The MOF file contains yearly records on Navy physicians from FY83 to FY88. The 1985 records were used in this thesis.

There are two main databases available for studying physicians. The Officer Master File (OMF) and the BUMIS MOF both provide information on Navy physicians but several

sources have noted that BUMIS is more detailed and reliable [Ref. 2:p. A1, Ref. 28:p.20]. The OMF does not contain adequate records of specialty codes and in several years the fraction without a valid code reaches one-third. Not only does the BUMIS file provide more adequate specialty information, it also contains more detailed information on obligation status and source of entry, essential in distinguishing between obligated and unobligated physicians and retention behavior by source of entry to the naval service. Because of these differences, the BUMIS file was selected for use to augment the 1985 Survey.

3. Data Limitations

The combined data set has three major limitations. First, the 1985 Survey data are not concurrent with a physician's career decision point. Up to four years have elapsed between the expression of opinions and perceptions by a survey respondent in 1985 and possible career orientation decisions as recent as 1988. There have been key policy changes in Navy medicine during this time period that may have impacted a service member's intentions or opinions. These policy variables include changes in the special pays physicians are eligible for, generally decreased support staff manning (nurses, corpsman, clerical workers), a great outflow of patients from the military treatment facilities to CHAMPUS,

Diagnostic Related Groups with physician monitoring of practice patterns, a major quality assurance/ utilization review program, contract physicians, contract nurses, PRIMUS and NAVCARE clinics, contracted emergency rooms, and a recent major reorganization.

The problem of using survey responses that do not coincide in time with behavior under investigation is always present when using survey data. Opinions and perceptions are likely to change over time in response to variation in the environment. Doering and Grissmer [Ref. 29:p. 35] point out that the only solution to this problem is to accept the expense of more surveys or to use much less scientifically designed controlled and administered end-of-service exit surveys.

The second limitation is the comparatively small sample size. There were only 191 Navy doctors who participated in the survey. Time-in-service, rank and other restrictions reduced the sample to 108 doctors. This small sample size prevents detailed analysis of the physician's specialties and their retention behavior.

The third limitation is reliance on self-reported data. Some respondents may not answer all questions truthfully, particularly questions relating to economic status such as personal debt, spouse income or family income. DMDC performed many checks and edits on the survey to ensure

consistency but the data remain subject to a respondent's self-reporting of the information. These inconsistencies weaken a variable's potential strength and the predictive ability of the model.

4. Sample Restrictions

Of the 191 physicians who took the survey, 108 remain in the final merged data set. First, each survey respondent record that was not matched with a Medical Officer file was deleted. Next, all those ineligible to leave the Navy due to obligation as of September 1988, the last update of the Survey with personnel records, were deleted. It is inappropriate to model behavior if the physician is unable to make a retention decision due to obligation. The sample was then restricted to the paygrades of Lieutenant and Lieutenant Commander with nine or fewer years of service to create a relatively homogenous sample of junior Navy physicians at their first career decision point.

5. Merged Data Set Characteristics

Table 7 describes the characteristics of the merged data set. lists the result of this analysis. In summary, the Table shows that the sample is composed primarily of white, male physicians who are married and in the paygrade of O3, and have received their commission through a direct appointment in the Armed Forces Health Professionals Scholarship Program.

TABLE 7. MERGED DATA SET CHARACTERISTICS

Description	Percentage
Biodemographic Characteristics	
Gender	
Male	66.0
Female	34.0
Race	
White	87.0
Black	3.5
Hispanic	5.2
Other	4.3
Age	
20-25	8.3
26-30	61.0
31-35	30.4
36-40	0.3
Marital Status	
Single	28.0
Married	72.0
Married w/ > 1 Dependent	53.0
Military Characteristics	
Rank	
LT	56.0
LCDR	43.0
Obligation Status	
On First Obligation	73.0
Non-obligated	27.0
Commissioning Source	
Direct Appointment from Civilian Status	19.1
Health Professionals Scholarship Program	75.1
Other Medical Specialist Programs	4.3
Other	0.9

TABLE 7. MERGED DATA SET CHARACTERISTICS
(continued)

Years of Service	
1	13.9
2	19.1
3	17.4
4	19.1
5	7.8
6	10.4
7	5.2
8	3.5
9	3.5
Physician Training/Certification	
Board Certified	16.0
Trained Specialists	24.0
Residents	23.0
General Medical Officers	37.0
Member's Current Status	
Stayers	47.0
Leavers	53.0

The average age is 29 years old. Females represent 34% of the sample, much higher than the 11% distribution of females in the Medical Corps. This reflects the stratification of the survey, designed to produce female samples large enough for analysis. The racial composition is 87% white and 13% non-white. The non-white portion consists of 3.5% black and 5.2% hispanic; the remaining 4.3% are other categories of race.

General Medical Officers (non-specialists) represent 37% of the sample. Physicians who are specialists represent 63% of the sample, composed of 32% medical specialists, 20.7% surgical specialists, and 10.3% hospital based specialists. Of the total sample, 16% are board certified specialists, 24% are trained specialists and 23% are enrolled in a residency program.

Finally, 47% of the sample chose to stay in the Navy while 53% chose to leave the Navy for civilian practice.

D. MODEL SPECIFICATION

1. Functional Form

A physician's decision to stay or leave the naval service may be described by a binary choice model. The physician compares alternatives and either stays in the Navy for an additional term of service or resigns to practice medicine in the civilian community, which ever maximizes his utility. Therefore, any model developed to describe this

behavior should be of the type where the dependent variable is dichotomous.

For such binary choice situations, the logit regression model is an appropriate functional form. The mathematical representation of the logistic distribution is:

$$P_i \text{ (Retention)} = \frac{1}{1 + e^{-z_i}}$$

where:

P_i = the probability that physician i stays in the Navy

e = Base of the natural logarithm

$z_i = \sum_j b_j X_{ij}$

X_{ij} = value of characteristic j for physician i

b_j = jth parameter to be estimated in the model.

This distribution was estimated by maximum likelihood methods using the Logist Procedure available on the Statistical Analysis System (SAS) software package [Ref. 30].

2. Dependent Variable Specification

The physician's actual behavior is the dependent variable. The 1985 Survey data is routinely matched with personnel records to obtain information on the subsequent retention behavior of survey respondents. The last match was performed in September 1988, providing a four year window for the survey respondent to decide to stay or leave. Thus, the

dependent variable is named **Status** and coded as a binary variable where (1) indicates the member remained on active duty in September 1988 and (0) if the member left active duty by the end of the four year interval.

E. EXPLANATORY VARIABLES

Table 8 lists the explanatory variables of the model. Each variable is defined by category below.

1. Biodemographic Variables

The **Minority** variable is a dummy variable derived from the 1985 Survey. Whites are coded (0) and blacks, hispanics and others are coded (1). It is expected that non-whites will have a decreased probability of retention. Minorities perceive the services as providing opportunity for advancement to positions of higher authority and training with less racial prejudice than many work places in the civilian world. Relative to whites, minorities will more frequently enter the service to obtain education, establish a track record, and gain experience, then leave the service for higher pay in the civilian sector.

Single is a dummy variable controlling for the effects of marital status. If a survey respondent was married for the first time, remarried or separated but not divorced, then the variable was coded (0), married. If the respondent was widowed, divorced or single (never married) then the variable

TABLE 8. REGRESSION MODEL EXPLANATORY VARIABLES

Variable		Definition	
Biodemographic			
(-)[a]	Minority	Categorical:	Non-White = 1; 0 else
(+)	Single	Categorical:	Single = 1; 0 else
(-)	Board Certified	Categorical:	Bd Cert = 1; 0 else
(-)	Trained	Categorical:	Trained = 1; 0 else
(-)	General Medical Ofcr	Categorical:	GMO = 1; 0 else
Tenure			
(-)	LCDR	Categorical:	LCDR = 1; 0 else
Economic			
(+)	Mil/Civ Pay ratio	Continuous:	0.2 - 0.84
Perceptual*			
(+)	Intrinsic Job Aspects	Continuous:	1 = Vdisat, 5 = Vsat
(+)	Extrinsic Job Aspects	Continuous:	1 = Vdisat, 5 = Vsat
(+)	Benefits Satisfaction	Continuous:	1 = Vdisat, 5 = Vsat

a. Expected sign of regression coefficient in parentheses

* Factor Analysis of selected Survey Questions O109105A--R

was coded as (1), single. It is postulated that being single will positively affect retention. There are no family disruptions due to deployments; single life is more consistent with the "Navy way of life."

This hypothesis is counter to civilian employment theories that suggest an inverse relationship between the number of dependents and turnover. It is assumed that the Navy environment is characterized by a different behavior pattern. Most physicians enter the Navy for training under scholarship programs and leave once obligation is liquidated. Married physician officers are expected to be more likely to choose the civilian sector at this time.

Board Certification, Trained and **General Medical Officer** (GMO) are categorical variables designed to capture the effects of physician training and certification status, from the 1985 Medical Officer File. Of the 108 physicians in the sample, 16% are board certified, 24% are physicans trained in a speciality but not board certified, 23% are physicians enrolled in a residency program to become specialists and the remaining 37% are general medical officers. Physicians enrolled in residency programs are the base case or reference individual. A set of dummy variables is used to capture retention differences for board certified physicians, physicians trained in a specialty but not a board

certified specialist, and a general medical officer (GMO) when the physician is neither a specialist nor in residency. Board certification in the civilian world is expected to increase earnings relative to non-board certified physicians. It is hypothesized that a Navy physician who obtains board certification is readying himself for practice in the civilian sector and this is expected to negatively impact physician retention. It is also hypothesized that being a non-board certified specialists or a general medical officer will negatively impact retention. This is consistent with the assumption that Navy Medicine is having trouble retaining physicians.

2. Tenure Variable

It is anticipated that the tenure variable **LCDR** will be negatively signed. LCDR paygrade is coded (1); LT paygrade is coded (0). LCDR paygrade is expected to decrease retention since it is at this paygrade that most physicians complete their obligation and, at their first career decision point, decide to leave the Navy.

3. Economic Variables

The military/civilian pay ratio has received much attention as a factor in physician retention. The **Mil/Civ Pay ratio** variable is military pay divided by civilian pay and must be constructed since neither the 1985 Survey nor the Medical Officer File contains this information.

The physician's military pay is constructed by summing the following variables in the 1985 Survey: Wages (taxable income: base pay plus physician special pays), and the non-taxable allowances such as Basic Allowance for Quarters (BAQ), Variable Housing Allowance (VHA), Basic Allowance for Subsistence (BAS). The physician special pay include Variable Special Pay (VSP), Board Certified Pay (BSP), Additional Special Pay (ASP), and Incentive Special Pay (ISP) plus any other taxable military income.

The 1985 Medical Economics Survey of Civilian Physician Income Survey was used to estimate comparable civilian pay. Appendix 1 lists the earnings for civilian specialists cross-referenced with 1985 Navy specialty codes.

The Mil/Civ Pay ratio is then the construct of military earnings divided by alternative civilian earnings. It is expected that as military/civilian pay ratio increases, retention will increase.

4. Perceptual Variables

The variables Satisfaction with Intrinsic Job Aspects, Satisfaction with Extrinsic Job Aspects, and Satisfaction with Benefits, were developed using factor analysis with variables selected from responses to questionnaire items 0109105A - 0109105R of the 1985 Survey. The rationale, technique and results of the factor analysis procedure are included in Appendix B.

The variables chosen for inclusion in the factor analysis procedure were selected on the basis of a comparison of mean responses for each question by stayers and leavers. These Survey questions ask respondents to rate their level of satisfaction on a particular issue on a scale of one to five. A rating of one indicates very dissatisfied, a rating of three no opinion, and a rating of five very satisfied. The mean responses were determined for stayers and leavers and compared using a T-Test procedure, testing the hypothesis for each question that the two means are equal. Questions for which the mean response by stayers and leavers was the same were eliminated from the factor analysis procedure, with the exception of satisfaction with Dental benefits, key in the development of the Satisfaction with Benefits variable. A detailed discussion of the results of this procedure are described in Chapter 4, Empirical Results. It is assumed that increasing satisfaction will lead to increased retention.

IV. EMPIRICAL RESULTS

A. COMPARISON OF MEANS: SATISFACTION VARIABLES

The survey questions 0109105A--R ask respondents to rate their level of satisfaction or dissatisfaction on a series of issues, considering current policies, on a five point scale where a rating of three indicates no opinion, a rating of five, very satisfied, and a rating of one, very dissatisfied. The mean responses for each question were determined and compared using T-Tests; Table 9 lists the results of this procedure. For example, referring to Table 9, Question 0109105 A asks respondents to rate satisfaction with personal freedom and Table 9 indicates that the means were significantly different at the .05 significance level.

The questions stayers and leavers responded similarly to are interesting. Stayers and leavers feel the same about family environment, moving, educational benefits and dental benefits. Both groups rated satisfaction with family environment (mean ≈ 3.6). Stayers and leavers were also generally satisfied with Dental benefits (mean ≈ 3.5) and retirement benefits (mean = 3.3). Respondents had no strong opinion for satisfaction with moving or educational benefits.

TABLE 9. COMPARISON OF MEANS: T-TESTS
SATISFACTION VARIABLES BY STATUS
O109105A--R

Num	Question	Mean Response (Leaver / Stayer)	Sig*
Significant differences: Leavers/Stayers			
105a	Pers Freedom	2.7 / 3.1	.05
105b	Friendships	3.7 / 4.0	.05
105c	Coworkers	3.5 / 4.0	.01
105d	Stability	3.2 / 3.5	.1
105e	Pay	3.1 / 3.6	.05
105i	Serve Country	3.7 / 4.1	.01
105j	Happy w/job	3.1 / 3.7	.01
105k	Promotions	3.0 / 3.6	.01
105l	Job Training	2.9 / 3.3	.05
105m	Job Security	3.3 / 3.6	.1
105n	Work Cond	2.7 / 3.3	.01
105p	Medical Benfts	3.7 / 4.1	.05
105r	Commissary Benefts	3.4 / 3.7	.05
Insignificant differences: Leavers/Stayers			
105f	Fam Environment	3.5 / 3.6	.43
105g	Moving Frequency	3.1 / 3.0	.78
105h	Retirement	3.3 / 3.3	.81
1105	Ed Benefits	3.0 / 3.1	.60
105q	Dental Benefits	3.4 / 3.6	.14

Leavers gave the lowest overall rating to any particular variable in this group. Leavers reported the least satisfaction with personal freedom and work conditions (mean 2.7), followed by job training (mean 2.9). There were no other ratings below 3.0 (indifference) for any other variable by stayers or leavers. This implies that these three areas may be significant factors in the physician's decision to leave the Navy.

The highest responses for any variable were given by stayers, rating serving country and medical benefits (mean = 4.1). Stayers also had the next highest ratings, rating friendships and co-workers (mean = 4.0). This implies that physicians may stay in the Navy because they derive satisfaction in these areas. One must use caution in attempting to interpret the importance of the "serving country" finding since few citizens of any nation will respond negatively to a question concerning the satisfaction they derive from serving their country.

B. REGRESSION RESULTS

This model of physician retention was estimated using the Logit Regression technique. The results of the regression are shown in Table 10. The model was designed to estimate the joint impact of these variables on the physician's stay/leave decision.

TABLE 10. LOGISTIC REGRESSION PROCEDURE DEPENDENT VARIABLE: STATUS CURRENT MEMBER STATUS

108 OBSERVATIONS
57 STATUS = 0
51 STATUS = 1
7 OBSERVATIONS DELETED DUE TO MISSING VALUES

VARIABLE	MEAN	MIN	MAX	ST DEV
LCDR	0.42	0	1	0.495
MINORITY	0.12	0	1	0.327
SINGLE	0.29	0	1	0.454
BD CERTIFIED	0.16	0	1	0.366
TRAINED	0.24	0	1	0.430
GMO	0.37	0	1	0.485
MIL/CIV PAYRAT	0.49	0.196	0.841	0.146
EXTRIN JOB SAT	2.99	0.022	4.685	0.848
INTRIN JOB SAT	3.00	0.584	4.511	0.889
BENEFITS SAT	3.00	0.646	4.612	0.870

-2 LOG LIKELIHOOD FOR MODEL CONTAINING INTERCEPT ONLY= 149.39

MODEL CHI-SQUARE= 33.35 WITH 10 D.F.(SCORE STAT.) P=0.0002.
CONVERGENCE IN 6 ITERATIONS WITH 0 STEP HALVINGS R= 0.355.
MAX ABSOLUTE DERIVATIVE=0.9816D-09. -2 LOG L= 110.52.
MODEL CHI-SQUARE= 38.87 WITH 10 D.F. (-2 LOG L.R.) P=0.0000.

VARIABLE	BETA	STD.ERR	CHI-SQUARE	P	R
INTERCEPT	-3.22	1.88	2.93	0.09	
LCDR	-1.01	0.59	2.98	0.08*	-0.081
MINORITY	-0.77	0.72	1.13	0.29	0.000
SINGLE	0.64	0.57	1.26	0.26	0.000
BDCERT	-2.94	1.03	8.12	0.004*	-0.202
TRAINED	-1.92	0.74	6.61	0.01*	-0.176
GMO	-2.04	0.82	6.24	0.013*	-0.169
MIL/CIV PAYRAT	1.92	2.09	0.84	0.36	0.000
EXTRIN JOB SAT	0.53	0.31	2.88	0.09*	0.077
INTRIN JOB SAT	0.65	0.31	4.47	0.03*	0.129
BENEFITS SAT	0.19	0.30	0.41	0.52	0.000

* Indicates that the beta coefficient is significant to the .1 level of significance

1. Significance and Signs of Variables

The tenure variable **LCDR** is significant and negatively signed as expected, indicating that promotion to this rank decreases retention probability. As discussed earlier, the military grade of LCDR is the grade at which most physicians complete their initial obligation and leave the military for civilian practice.

The **Minority** variable is not statistically significant but is negatively signed, associated with decreased retention probability. This was expected since it was hypothesized that minorities enter the military to gain both experience and reputation, then leave the military for employment in the more lucrative civilian sector. The fact that the variable was not statistically significant may be due to the fact that there were only 12 minority physicians of the total 108.

The effects of being female were not controlled for in the model. A cross-tabulation comparison of stayers and leavers by gender revealed that female physicians behave identically to male physicians. This is noteworthy given the extensive coverage given to the overall higher turnover rates for females suggested by theories touting interrupted career patterns. This model's results suggest that female physicians do not follow this pattern.

The marital status variable **Single** is not statistically significant but is positively signed. Being single is associated with higher probability of retention, holding other factors constant. This is interesting in that most theories suggest that having dependents tends to increase retention probability. This may reflect the compatibility of the "single" lifestyle with long deployments often incurred by naval personnel.

Board Certification is strongly significant and negatively signed indicating decreased retention likelihood relative to a physician in a residency program[1]. This probably reflects the increased marketability of the board certified physician in the private sector. This finding lends support for the recent increases in Board Certification Pay, necessary to offset the negative impact board certification has on retention. Physicians **Trained** in a specialty but not board certified are also more likely to leave the Navy than physicians opting for residency training, indicated by the significant and negatively signed variable coefficient. The impact is approximately one-third less than the negative impact of board certification. Being a **General Medical Officer** or non-specialist also has a negative impact on

[1]A physician in a residency program at the time of the survey is defined as the base case or reference physician. The full explanation of the base case is given in section B (3), Partial Effects Analysis, later in this Chapter.

retention relative to the reference physician, indicated by the negatively signed coefficient and highly significant coefficient. The impact is slightly larger than that of being a non-board certified specialist. This finding highlights the problems in retaining physicians, whether board certified, trained or untrained.

The **Mil/Civ Payratio** variable is not significant although positively signed. Increased retention is associated with a larger military/civilian payratio, other factors held constant. It was expected that the payratio variable would be significant since the pay gap has received much public attention. This may indicate that pay is not as important for junior physicians as it is for senior physicians, or in other words, pay elasticity varies with age of physician. Physicians entering the Navy under scholarship expect training and experience in exchange for obligated service. They also expect good training, job satisfaction, a fair standard of living and anticipate higher salary later in their career. Support for this line of reasoning can be seen in the survey respondents' rating of overall satisfaction with pay, Question 0109105E. The mean rating by stayers was 3.6 (3.0 - indifference; 4.0 - satisfied; 5.0 - very satisfied) and leaver's mean rating for satisfaction with pay was 3.1. These findings indicate that pay is important to the physician with eight or less years of service and may entice more of them to

stay but other factors may achieve the same end at less cost. The small sample size, unfortunately, precludes further analysis of this hypothesis.

The **Satisfaction with Extrinsic Job Aspects** construct variable is significant and positively signed indicating that as physicians become more satisfied with promotions, job security, co-workers, friendships and serving their country, they will be more likely to stay in the Navy. The **Satisfaction with Intrinsic Job Aspects** construct variable is also significant and positively signed indicating that a physician's satisfaction with factors intrinsic to the job positively affects retention. As discussed in Appendix B, these factors are happiness with present job, job training work conditions, and personal freedom. This implies that policies and programs which increase a physician's satisfaction in these areas will make his more likely to stay in the Navy. The **Satisfaction with Benefits** construct variable is positively signed but not significant indicating that satisfaction with medical and dental benefits is associated with increased retention.

2. Goodness of Fit

The Chi-square statistic tests the hypothesis that all the regression coefficients equal zero.[Ref. 30:p. 271] From Table 10, the model Chi-square is 38.83 with 10 degrees of freedom, significant to greater than 99% confidence level (p

= 0.0001). The R statistic, similar to the multiple correlation coefficient in Ordinary Least Squares regression where correction is made for the number of explanatory variables estimated in the model, is a measure of the predictive ability of the model. R has a value of (0) if the model is of no value and (1) if the model predicts perfectly. The model's R statistic is 0.355, indicating moderate predictive power.

A goodness-of-fit test for a model is the percentage of cases that the model predicts correctly. [Ref. 20:p. 49-50] This test is performed by substituting the actual characteristics of individuals into the estimated equation. If the predicted probability from the equation equals or exceeds 0.47, that individual is classified as a stayer and if less than 0.47 then he is predicted to leave. A cutoff point of 0.47 was chosen since 47% of the sample decided to stay in the Navy. Predicted and actual outcomes were then prepared and a prediction was counted as correct when actual and predicted outcomes were the same and incorrect when they were different. One may conclude that any model provides useful information when this prediction method is better than a naive prediction rule that says everyone follows the majority.

Table 11 illustrates the goodness of fit showing actual behavior and the model's predicted outcomes. In this

case the naive rule predicts that everyone leaves of which 53% (57/108) would be correct. The model predicts 51% (55/108) would leave and correctly predicts this 74% (80/108) of the time, higher than the 53% correct rate by the naive rule.

TABLE 11. CLASSIFICATION TABLE

		PREDICTED		
		NEGATIVE	POSITIVE	TOTAL
TRUE	NEGATIVE	42	15	57
	POSITIVE	13	38	51
	TOTAL	55	53	108

SENSITIVITY: 74.5% SPECIFICITY: 73.7% CORRECT: 74.1%
FALSE POSITIVE RATE: 28.3% FALSE NEGATIVE RATE: 23.6%
C=0.823 SOMER DYX=0.647 GAMMA=0.647 TAU-A=0.325

Further, the model predicts staying and leaving with nearly equal power. The sensitivity is 74.5%, which is the proportion of true positive predicted to be positive. The specificity is 73.7%, which is the proportion of true negatives predicted to be negative. The false positive rate is 28.3% and the false negative rate is 23.6% indicating that the model has a slightly higher rate of false positive

predictions than false negative predictions. Based on above, the model provides a good statistical fit for the d

3. Partial Effects Analysis

A partial effects analysis was done to estimate the relative impact of each variable in the model on retention. To estimate these impacts, a base case or reference profile was developed. The reference individual is an unmarried, caucasian physician currently in a residency program who holds the rank of Lieutenant. The mean value for the continuous variables of the reference individual are as follows:

> payratio = 0.49; Satisfaction with Intrinsic Job Aspects = 3.0; Satisfaction with Extrinsic Job Aspects = 3.0; and, Satisfaction with Benefits = 3.0.

Substituting these characteristics into the model yields a computed retention probability of 0.86 likelihood of staying in the Navy.

Table 12 shows the change in retention probability of the base case physician for each variable. Each change in retention probability was calculated holding other factors constant; the continuous variables were evaluated at a (1) standard deviation change from the mean.

The variable with the largest impact on retention is board certification, reducing retention likelihood from 0.86 to 0.25, a decrease of -0.61.

Being a general medical officer drops retention from 0.86 to 0.45, a decrease of -0.41. Being a fully trained

specialist without board certification has the next largest impact, dropping retention probability by -0.38 to 0.48. Promotion to the paygrade LCDR reduces retention by 0.17 and being minority changes retention by -0.12.

TABLE 12. PARTIAL EFFECTS ANALYSIS

Base Case Retention Prob = .86

Variable	Change in Prob (y=1)	New Prob
LCDR	-0.17	.69
Minority	-0.12	.74
Single	0.04	.90
Board Certification	-0.61	.25
Trained	-0.38	.48
General Medical Officer	-0.41	.45
Mil/Civ Pay ratio*	0.03	.89
Extrinsic Job Sat*	0.06	.88
Intrinsic Job Sat*	0.06	.92
Benefits Sat*	0.02	.88

* Evaluated at one standard deviation change from the mean

Several explanatory variables positively affect retention probability. A change of one standard deviation from the mean for Extrinsic Satisfaction retention probability from 0.86 to 0.88. Intrinsic Satisfaction increases retention by 0.06, from 0.86 to 0.92. Being single adds 0.04 to retention probability, raising the probability from .86 to .90. Evaluated at a one standard deviation change from the mean, the Mil/Civ pay ratio increases retention probability from 0.86 to 0.88, an increase of 0.03.

C. COMPARISON OF RETENTION INTENTION AND ACTUAL BEHAVIOR

Table 13 compares stated physician retention intentions expressed in 1985 with actual retention behavior, as of September 1988. The Survey, matched annually with personnel files by the Defense Manpower Data Center to determine the subsequent stay/leave behavior of the respondents, was last matched in September 1988, creating a four year window (from the time the survey was administered, September 1984) for physicians to decide to stay or leave. Stay/leave intentions were derived from the survey question that asks "When you finally leave the military, how many <u>total</u> years of service do you expect to have" (Question O27E26), minus the respondent's actual years of service at the time of the Survey.

TABLE 13. COMPARISON OF RETENTION INTENT (1985) TO ACTUAL BEHAVIOR (1988)

CLASSIFICATION TABLE

		INTENT		
		LEAVE	STAY	TOTAL
ACTUAL	LEAVE	37	20	57
	STAY	6	45	51
	TOTAL	43	65	108

Correct: 76%
False Positive Rate: 19% False Negative Rate: 6%
Chi-Square = 31.75 Prob value ≤ .001

To compare intentions with actual behavior, intended stayers were all those who planned to stay at least past the "window of opportunity to leave," represented by the four year interval from September 1984 through September 1988. Therefore, if a respondent's total intended years of service minus his current years of service is at least four years, than the respondent is coded as a stayer; if the total intended years of service minus actual years of service is less than four years (meaning he chooses to leave in the interval of interest), then the respondent is coded as a leaver.

Of the 65 physicians intending to stay in the military for at least four more years, 45 actually stayed. The 20 physicians who changed their mind constitute a false positive rate of 19% (20/108). Of the 43 physicians expressing intent to leave, 37 actually left while 6 had a change of heart and decided to stay, a false negative rate of 6% (6/108). The overall accuracy of the 1985 retention intentions versus the 1988 actual retention is 76% (37 + 45/108). Intuitively, one expects that as time elapses from stated intention to expression of actual behavior, the likelihood of behaving as intended would decrease due to changes in important alternatives.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

This paper analyzed the factors that influence the career of 108 Lieutenant and Lieutenant Commander physicians with eight or fewer years of service. A multivariate logit regression was used to estimate the relative importance of these factors, categorized as biodemographic, tenure, economic, and perceptual variable categories. The dependent variable was dichotomized into physicians either staying or leaving the Navy. Minority status, marital status, gender and the military/civilian pay ratio were found to have no statistically significant impact on physician retention behavior, where the 10% level of significance was established as the overall acceptance level.

A major objective of the thesis was to analyze the relative effects of economic and perceptual variables in explaining retention. Although not significant, it is difficult to discount the importance of pay as retention factor. The pay differential for the average physician in this study is 49% of alternative civilian earnings and much larger for surgeons and hospital-based physicians (anesthesiologists, radiologists and pathologists), who earn $60,000 to $73,000 less than their civilian counterparts. It is likely that all military physicians are to some extent

dissatisfied with pay and the limited variation in the actual military/civilian pay ratios are responsible for the lack of significance.

Nonetheless, pay may not be as important for physicians with eight or fewer years of service as it is for the physician who is a board certified specialist. While pay increases may entice more junior physicians to stay, other factors such as good training, job satisfaction, bonuses and expectation of higher salary through rapid promotions later in their career may achieve the same end at less cost.

Extrinsic job aspects significantly affect retention. These include satisfaction with promotions, job security, co-workers, friendships and serving their country. Since these factors are important to physicians, they may be useful in physician recruitment. Physician recruiting campaigns that promote the quality of promotions, job security, co-workers, and being able to serve country may entice more physicians to enter the service. These non-pecuniary aspects of military life may particularly entice private practice physicians to enter the service, especially those working for health maintenance organizations since those organizations are very similar to the Navy in medical practice characteristics.

B. LIMITATIONS OF THE STUDY

The small sample size is the major limiting factor in this thesis. Analysis of specialties and responsiveness to pay were intended but the sample size did not support this type of analysis. The explanatory variables are inter-related. Hence, the model is sensitive to minor changes in specification. Further work on these inter-relationships is needed. The model is built on cross-sectional data. Time series data is more desirable since changes in events that affect retention occur across time and could be captured by a model built on appropriate time series data instead of identifying relevant factors at a single point in time. Finally, the data are becoming out of date. The survey from which the data were taken was administered five years ago. With the changes in medical department staffing and structure over the past five years, there are certainly other issues that physicians may find important in making a choice to stay or leave.

C. RECOMMENDATIONS FOR FURTHER RESEARCH

Following the technique of McMahon [Ref. 24], a time-series, cross sectional model of navy physician retention could be built using the entire 1982-1988 and later BUMIS MOF file. Although susceptible to problems with autocorrelation and heteroscedasticity, any model developed based on time-

series, cross-sectional data would over come some of the limitations encountered in this thesis.

Physician retention decisions are very sensitive to intrinsic and extrinsic job satisfaction aspects. The more dissatisfied a doctor is with these aspects, the less likely he will be to stay in the Navy. The intrinsic job aspects include levels of happiness with the current job, job training, work conditions and personal freedom. Leadership styles, programs and policies that interfere with physician satisfaction in these areas decrease retention. Further research might be done by attempting to define particular areas of satisfaction so that effort might be expended to maintain it at high levels. Surveys might be developed and analyzed to asses the problems with job training and work conditions. Possible areas to consider would include:

- the good and poor qualities of physician residency programs;
- leadership;
- limits on travel to professional meetings;
- liquidation of TAD claims;
- time for research pursuits;
- equipment quality; and,
- support staff.

Aside from further research on the age-pay elasticity issue, much information might be gained by estimating separate

equations for non-obligated volunteers and obligated volunteers (scholarship physicians) to determine more precisely what entices already trained doctors to enter the Navy. Also of interest would be a comparison of separate equations for reservists and regular physicians, male and female physicians, and separate regression models for selected specialties which would highlight exactly where bonuses might be most cost effective. Small sample size precluded analysis of these issues in this thesis.

APPENDIX A

CIVILIAN PAY/SPECIALITY CODE CROSS REFERENCE

Specialty	1985 Civ Earnings	Navy 1985 Spec Code
Neurosurgeon	$192,670	1575
Orthopedic Surgeon	$168,750	1507
Radiologists	$150,000	1636
Anesthesiologists[a]	$134,170	1622
		1629 Pathologists
Ob/Gyn	$121,410	1510
General Surgeons	$120,830	1503
Internists	$ 89,630	1601
Psychiatrists	$ 80,380	1620
Pediatricians	$ 79,110	1613
Family Practitioners	$ 76,530	1618
General Practitioners	$ 71,540	1501 (GMO's)
All Non-surgical specialists[b]	$ 94,680	1603 Cardiology
		1604 Endocrine
		1605 Gastro
		1606 Hem/Onc
		1607 Inf Dis
		1610 Pulmonary
		1623 Neurology
All Surgical Specialists[c]	$132,640	1520 Ophth Peds
		1521 Ophth Sgn
		1524 EENT
		1619 Dermatology

a) Since no survey data was available for pathologists, they were assigned the same pay as anesthesiologists, a comparable hospital based specialty

b) Since no survey data was available for the medical subspeciality codes listed, they were assigned the average annual salary for non-surgical specialists

c) Since no survey data was available for the surgical subspeciality codes listed, they were assigned the average for all surgical specialists

APPENDIX B FACTOR ANALYSIS RESULTS

Questions O109105A-R are a series of questions asking respondents to rate satisfaction with a variety of issues dealing with characteristics of their job and military life in general. Factor Analysis was used as a way to capture the richness of the data while reducing the large number of variables down to a smaller set which relate to specific underlying factors.

As determined earlier in this thesis, several of these variables were found contribute marginally to explaining the retention decision since there was no difference in the mean response by stayers and leavers. The following variables were thus eliminated from the factor analysis procedure:

O109105F Family Environment

O109105G Moving

O109105H Retirement

O1091050 Educational Benefits

O109105D, Stability and O109105R, Commissary Benefits were deleted from the procedure since they did not load on any factor above an arbitrarily set factor loading score of 0.34. O109105E, Pay satisfaction was also deleted from the analysis since economic considerations were already accounted for in the model via the military/civilian payratio variable. In

all, seven variables were deleted from the procedure. The data was transformed by factor analysis into three variables as follows, shown as Table B-1.

TABLE B-1. FACTOR ANALYSIS PRODUCTS

FACTOR LOADINGS

Title	F Loading
Intrinsic Job Satisfaction	
Happy w/job	.82
Job Training	.62
Work Conditions	.58
Personal Freedom	.43
Extrinsic Job Satisfaction	
Job Security	.66
Promotions	.66
Co-workers	.60
Friendships	.57
Serve Country	.44
Benefits	
Dental	.80
Medical	.67

The variables were coded on the survey such that a response of 1 meant the highest possible level of satisfaction. The direction of coding for the majority of other questions in survey was opposite; the larger the number, the greater the

satisfaction. These variables were recoded to conform with the direction of coding with the other variables in the survey for consistency in interpretation of the variable coefficients. The factors were then extracted using Iterated Principal Factor Analysis. A Varimax Orthogonal Transformational Rotation was employed to achieve more interpretable results. The first factor is named Satisfaction with Intrinsic Job Aspects since the variables loading most heavily here appear to be related to satisfaction with intrinsic aspects of the job; levels of happiness with the current job; job training; work conditions; and personal freedom. The Factor loadings show which variables are most important in the factor. Happiness with the job is the most important aspect of this factor and personal freedom loaded least important.

The second factor is named Satisfaction with Extrinsic Job Aspects since the variables loading here seem to be related to satisfaction with extrinsic elements of the job or military life. Here, job security and promotions are equally important while work group/co-workers and serving country are of relatively less importance.

The importance of medical and dental benefits are captured in the third factor, Satisfaction with Benefits.

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